April 10, 1998

EA 98-150; 98-151; 98-152

Mr. E. E. Fitzpatrick
Executive Vice President
Nuclear Generation Group
American Electric Power Company
500 Circle Drive
Buchanan, MI 49107-1395

SUBJECT: NRC INSPECTION REPORT NO. 50-315/98005(DRS); 50-316/98005(DRS)

Dear Mr. Fitzpatrick:

On February 27, 1998, the NRC completed an on-site inspection at your D. C. Cook 1 and 2 reactor facilities. A final exit to update your staff on the regulatory characterization of issues identified in this inspection was conducted by telephone on March 19, 1998. The purpose of this inspection was to review your activities related to surveillance testing, corrective action and maintenance of the design basis for the ice condenser. The enclosed report presents the results of this inspection.

Based on the results of this inspection, 29 apparent violations were identified and are being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600.
These apparent violations are grouped into three areas; surveillance testing, corrective action and maintenance of the design basis as discussed below.

Eight apparent violations of 10 CFR 50 Appendix B (three Criterion V, four Criterion XI, and one Criterion VII) and two apparent violations of technical specifications were identified pertaining to inadequate surveillance testing of the ice condenser. Specifically, these violations related to, inadequate instructions, inadequate acceptance limits, inadequate control of contractors, failure to implement technical specification requirements and entry into an unanalyzed condition. Additionally, an apparent violation 10 CFR 50 Appendix B, Criterion V was identified for failure to follow the procedure change process for completed surveillance tests. Collectively, these apparent violations represent a programmatic breakdown in surveillance testing of the ice condenser.

Seven apparent violations of 10 CFR 50 Appendix B, Criterion XVI were identified pertaining to your staff's failure to promptly identify conditions adverse to quality or take appropriate corrective actions. Inspectors' intervention was necessary to prompt your staff to identify: blocked flow passages, missing ice segments, dented/buckled basket webbing, unweighable ice baskets, and nonencapsulated insulation within the ice condenser. Further, inspectors' intervention was necessary to prompt your staff: to implement corrective actions for missing ice

basket sheet metal screws, to take corrective actions for preventing the recurrence of loose U-bolt nuts and separated ice baskets, and to take appropriate corrective actions for the ice baskets with defective hold down bar welds. Collectively, these apparent violations represent a breakdown in your corrective action program for the ice condenser.

Seven apparent violations of 10 CFR 50.71(e) were identified pertaining to your staff's failure to update and maintain the Final Safety Analysis Report Appendices J and M, which contain the detailed description and design basis for the ice condenser. Additionally, four apparent violations of 10 CFR 50 Appendix B, Criterion III were identified pertaining to a failure to follow the established design control process for ice basket modifications. Collectively, these apparent violations represent a programmatic breakdown in the maintenance of the design basis for the ice condenser.

NRC intervention was needed to call attention to these programmatic problems. Further, the weaknesses in each of these program areas has directly or indirectly contributed to a poor state of materiel condition for each ice condenser, such that the ability of the ice condenser to perform its design function during past plant operation is in question. Allowing the ice condensers to degrade to this condition demonstrates that your staff did not pay appropriate attention to maintaining the reliability and availability of a key safety system.

No Notice of Violation is presently being issued for these apparent violations. In addition, be advised that the number and characterization of the apparent violations described in the enclosed inspection report may change as a result of further NRC review.

An open predecisional enforcement conference to discuss these apparent violations will be scheduled in the near future. The decision to hold a predecisional enforcement conference does not mean that the NRC has determined that violations occurred or that enforcement action will be taken. This conference will be held to obtain information to enable the NRC to make an enforcement decision, such as a common understanding of the facts, root causes, missed opportunities to identify the apparent violations sooner, corrective actions, significance of the issues, and the need for lasting and effective corrective action. In addition, this is an opportunity for you to provide any information concerning your perspectives on: 1) the severity of the violations, 2) the application of the factors that the NRC considers when it determines the amount of a civil penalty that may be assessed in accordance with Section VI.B.2 of the Enforcement Policy, and 3) any other application of the Enforcement Policy to this case, including the exercise of discretion in accordance with Section VII.

You will be advised by separate correspondence of the results of our deliberations on this matter. No response regarding these apparent violations is required at this time.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

original /s/ J. A. Grobe
John A. Grobe, Director
Division of Reactor Safety

Docket Nos.: 50-315, 50-316
License Nos.: DPR-58, DPR-74

Enclosure: Inspection Report No. 50-315/98005(DRS);
50-316/98005(DRS)

cc w/encl: John Sampson, Site Vice
President
A. A. Blind, Vice President
Nuclear Engineering
Douglas Cooper, Plant Manager
Richard Whale, Michigan Public
Service Commission
Michigan Department of
Environmental Quality
Emergency Management
Division, MI Department
of State Police

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Sincerely,

John A. Grobe, Director
Division of Reactor Safety

Docket Nos.: 50-315, 50-316
License Nos.: DPR-58, DPR-74

Enclosure: Inspection Report No. 50-315/98005(DRS);
50-316/98005(DRS)

cc w/encl: John Sampson, Site Vice President
A. A. Blind, Vice President Nuclear Engineering
Douglas Cooper, Plant Manager
Richard Whale, Michigan Public Service Commission
Michigan Department of Environmental Quality
Emergency Management Division, MI Department of State Police

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-315; 50-316
License Nos:	DPR-58; DPR-74
Report Nos:	50-315/98005(DRS); 50-316/98005(DRS)
Licensee:	Indiana Michigan Power Company
Facility:	Donald C. Cook Nuclear Generating Plant
Location:	1 Cook Place Bridgman, MI 49106
Dates:	January 21 through February 27 and March 19, 1998.
Inspectors:	B. Bartlett, Senior Resident Inspector, D. C. Cook D. Jones, Reactor Engineer M. Holmberg, Reactor Engineer
Approved by:	J. A. Gavula, Chief Engineering Specialists Branch 1 Division of Reactor Safety

EXECUTIVE SUMMARY

D. C. Cook, Units 1 and 2
NRC Inspection Reports 50-315/98005; 50-316/98005

This nonroutine inspection focused on the conduct of past surveillance testing, corrective actions and maintenance of the design basis for the ice condenser in each Unit. The following specific observations were made:

Maintenance

- Eight apparent violations of 10 CFR 50 Appendix B (three Criterion V, four Criterion XI, and one Criterion VII) and two violations of technical specifications (TS) were identified pertaining to inadequate surveillance testing of the ice condenser. Specifically, these violations pertained to inadequate instructions, inadequate acceptance limits, inadequate control of contractors, failure to implement TS requirements and entry into an unanalyzed condition for ice condenser surveillance testing. (Section M1.1)

- Two examples of an apparent violation of 10 CFR 50 Appendix B, Criterion V were identified for the licensee's failure to follow the procedure change process for changes made to completed surveillance tests. (Section M1.1)

- Collectively, the apparent violations associated with surveillance testing activities represented a breakdown in the surveillance testing program for the ice condenser. (Section M1.1)

- Three apparent violations of 10 CFR 50 Appendix B, Criterion XVI were identified for the licensee's failure to identify conditions adverse to quality. Conditions not previously identified by the licensee in the ice condenser included: blocked flow passages, missing ice segments, dented/buckled basket webbing, unweighable ice baskets, and nonencapsulated insulation. (Section M2.1)

- The ice condenser was degraded to a poor state of materiel condition such that the operability of the ice condenser was in question. (Section M2.1)

Engineering

- Four apparent violations of 10 CFR 50 Appendix B, Criterion XVI were identified for the licensee's failure to identify and correct conditions adverse to quality on ice condenser components. Specifically, these violations pertained to the licensee's failure: to implement prompt corrective actions for missing ice basket sheet metal screws, to implement effective corrective actions for preventing the recurrence of loose U-bolt nuts and separated ice baskets, and to take appropriate corrective actions for the ice baskets with defective hold down bar welds. (Section E2.1)

- Collectively, the apparent violations identified in Sections M2.1 and E2.1 represent a breakdown in the licensee's corrective action program for the ice condenser. (Section E2.1)

- Seven apparent violations of 10 CFR 50.71(e) were identified pertaining to the licensee's failure to update the Final Safety Analysis Report (FSAR) Appendices J and M, which contained the detailed description and design basis for the ice condenser. (Section E7.1)

- Four apparent violations of 10 CFR 50 Appendix B, Criterion III were identified pertaining to the licensee's failure to follow the established design control process for ice basket modifications. (Section E7.1)

- Collectively, the apparent violations identified in Section E7.1 represent a programmatic breakdown in the maintenance of the design basis for the ice condenser. (Section E7.1)

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REPORT DETAILS

II. Maintenance

M1 Conduct of Maintenance

M1.1 Ice Condenser Surveillance Testing

a. Inspection Scope (61700)

Inspectors reviewed completed surveillance tests, interviewed licensee staff and contractors that conducted surveillance testing, and reviewed condition reports pertaining to surveillance testing of the ice condenser.

b. Observations and Findings

b.1 Ice Condenser Flow Passage Surveillance Testing

b.1.1 Inadequate Instructions for Visual Examination of Flow Passages

The licensee completed surveillance test procedure 12 EHP 4030 STP.250 "Inspection of Ice Condenser Flow Passages," Revision 1 on January 5, 1998, for Unit 1 and on November 15, 1997 for Unit 2. During these surveillances, 48 flow passages in each Unit were verified to be free of ice buildup greater than 3/8 inch thick.

On January 22, 1998, inspectors identified blocked flow passages in each Unit (Section M2.1.b.1), which prompted a licensee inspection of all flow passages in both Units. From this inspection, the licensee identified that 8 of the 48 flow passages inspected during the January 5, 1998 performance of the 12 EHP 4030 STP.250 for Unit 1, were partially obstructed with ice greater than 3/8 inch thick. Additionally, 13 of the 48 flow passages previously inspected during the November 15, 1997 performance of STP.250 on Unit 2 were subsequently found partially obstructed with ice greater than 3/8 inch thick. The contractor and an ice condenser system engineer that performed these inspections, had used a six volt flashlight to verify the flow passages free of obstructions.

Step 3.2 of 12 EHP 4030 STP.250 stated that portable lights will be obtained as necessary to inspect ice condenser passages. No other explicit instructions were given for the conduct of this visual examination. This procedure did not require: the visual examinations to be conducted from above and below the flow passages, the installed lighting in the lower ice condenser to be turned on, the use of special lighting methods demonstrated to be adequate (e.g. narrow tube lighting lowered into the flow passage). Further, this procedure did not require inspection personnel to pass a visual examination nor did it invoke a visual examination qualification standard (e.g. American Society of Mechanical Engineers Code VT-2 qualification).

The instructions provided in step 3.2 of 12 EHP 4030 STP.250 were inappropriate for the circumstances in that, the ice blockage had not been detected using the existing instructions. Failure to ensure appropriate instructions for the circumstances were included in 12 EHP 4030 STP.250 is an apparent violation of 10 CFR 50 Appendix B, Criterion V

(EEI 50-315/98005-01(DRS); EEI 50-316/98005-01(DRS)).

b.1.2 No Systematic Method for Selection of Flow Passages

The inspector noted that the blocked flow passages recently identified (see section M2.1.b.1) were predominantly adjacent to radial row 1 and/or row 2 ice baskets in each bay. The ice condenser system engineer reported that past flow passage selection did not include preferentially selecting these areas for inspection, nor were flow passages previously inspected in past surveillances excluded.

Step 3.3 of 12 EHP 4030 STP.250 required that the Lead Test Engineer identify the flow passages to be inspected. The Test Engineer's selection process was arbitrary, in that it did not include preferential selection of bay areas with a history of blockage problems nor did it exclude flow passages inspected during prior surveillances. Thus, inspectors concluded that the arbitrary selection process used was inadequate to ensure that a degraded condition would be detected in the ice condenser prior to reaching an inoperable condition.

The instructions provided in Step 3.3 of 12 EHP 4030 STP.250 were inappropriate for the circumstances, in that the Test Engineer was allowed to use an arbitrary process, vice a systematic process for selection of ice condenser flow passages for inspection. Failure to ensure appropriate instructions for the circumstances were included in 12 EHP 4030 STP.250 is an apparent violation of 10 CFR 50 Appendix B, Criterion V (EEI 50-315/98005-02(DRS); EEI 50-316/98005-02(DRS)).

b.1.3 Lack of Margin to Analysis Limit for a Degraded Ice Condenser

A 15 percent blockage limit was used in the analytical input value for groupings of bays modeled in the Westinghouse analysis WCAP 11902 "Reduced Temperature and Pressure Operation for Donald C. Cook Nuclear Plant Unit 1 Licensing Report," dated October 1988. Inspectors identified that the ice condenser could be considered operable using criterion in procedure 12 EHP 4030 STP.250 and returned to service with blocked flow passages above the maximum assumed in this analysis.

Option 2 of Step 7.1.3 and Step 7.2.3 "Operability Determination" of 12 EHP 4030 STP.250, authorized the licensee to consider the ice condenser operable, if the as-left percentage of total upward flow area per bay blocked was less than 15 percent. The licensee searched surveillance records back to 1990 and identified that Option 2 had been used for Unit 2 in January of 1994 and again in April of 1996. The licensee stated that the method used to determine the percentage blockage in each bay during these past surveillances was based entirely on engineering judgement (e.g., no formal calculations were performed). Inspectors concluded that the licensee's reliance on engineering judgement and lack of a required quantifiable calculation methodology (e.g., independent calculations comparing areas blocked with available bay flow passage area) would result in a wide error margin.

The instructions provided in Step 7.1.3 and 7.2.3 of 12 EHP 4030 STP.250 did not adequately incorporate the assumed analysis limit of 15 percent flow blockage. Specifically, the 15 percent acceptance criterion used in Steps 7.1.2 and 7.2.3 did not account for surveillance measurement errors. These measurement errors, when

considered, would result in a flow passage blockage acceptance criterion in excess of that analyzed. Failure to adequately incorporate the acceptance limits assumed in the accident analysis (WCAP 11902) for the percent of flow passage blockage into 12 EHP 4030 STP.250 is an apparent violation of 10 CFR 50 Appendix B, Criterion XI (EEI 50-315/98005-03(DRS); EEI 50-316/98005-03(DRS)).

b.2 Ice Weight Surveillance Testing

b.2.1 Lack of Margin to Analysis Limit for Maximum Ice Basket Weight

From data provided in the FSAR, Appendix M, Table 4.3-1, the maximum analyzed combined ice basket with ice weight (gross ice basket weight) assumed in accident analysis was 1776 pounds (lbs). On March 1, 1990, the licensee accepted the Westinghouse analysis "Indiana Michigan Power D.C. Cook Nuclear Power Plant Ice Condenser Seismic Load Study New Ice Basket Design," dated February 28, 1990, that evaluated an increase in gross ice basket weight of up to 1877 lbs. Inspectors identified that ice baskets with gross weight in excess of this analysis limit could be accepted by the licensee during the performance of 12 EHP 4030 STP.211 "Ice Condenser Surveillance," Revision 2 and returned to service.

Attachment 4 of 12 EHP 4030 STP.211 allowed a maximum acceptable gross ice basket weight of 1877 lbs. This 1877 lbs limit did not incorporate a margin for error associated with the measurement uncertainty in performing the basket weighing surveillance. Further, repetitive weighing and averaging weights for the same ice basket was required by the procedure to get an accurate ice basket weight, which indicated a substantial margin of measurement uncertainty. Thus, inspectors concluded, that surveillance measurement errors, when considered, would result in a maximum gross ice basket weight acceptance criterion in excess of that previously analyzed.

The instructions provided in Attachment 4 of 12 EHP 4030 STP.211 did not adequately incorporate the assumed analysis limit of 1877 lbs for the gross ice basket weight. Specifically, the 1877 lbs gross ice basket weight acceptance criterion used in Attachment 4 did not account for surveillance measurement errors, which when considered, would result in a gross ice basket weight in excess of that analyzed. Failure to adequately incorporate the acceptance limits assumed in the accident analysis (Indiana Michigan Power D.C. Cook Nuclear Power Plant Ice Condenser Seismic Load Study New Ice Basket Design," dated February 28, 1990) for gross ice basket weight into 12 EHP 4030 STP.211 is an apparent violation of 10 CFR 50 Appendix B, Criterion XI (EEI 50-315/98005-04(DRS); EEI 50-316/98005-04 (DRS)).

b.2.2 Unanalyzed Condition Authorized

Table 6.0-1 of Appendix M of the FSAR lists a design basis loss of coolant accident (DBA), uplift force of 2536 lbs for the ice baskets. To resist this force, the bottom of each ice basket is pinned to the support structure using a clevice pin. During a DBA the forces generated on unpinned ice baskets could cause them to be expelled upward out of the ice bed, which would create an unanalyzed missile hazard.

Step 4.8 of EHP 4030 STP.211, Revision 2, allowed up to 60 ice baskets to be unpinned in operating Modes 3 and 4 to support ice basket weighing operations. The earlier version of

this procedure (e.g., step 4.7 of 12 THP 4030 STP.211 “Ice Condenser Surveillance,” Revision 17) authorized unpinning of up to 60 ice baskets in operating Modes 1 through 4. These procedure steps lacked instructions to implement the TS 3.6.5.1 Action statement for an inoperable ice condenser. Inspectors identified that the ice condenser should have been considered inoperable during this step, because unpinning of multiple ice baskets as allowed in EHP 4030 STP.211 represented an unanalyzed condition.

The instructions provided in Step 4.8 of 12 EHP 4030 STP.211 were inappropriate for the circumstances, in that no analysis existed to support operation with 60 unpinned ice baskets and this step lacked instructions to implement the TS 3.6.5.1 Action statement for an inoperable ice condenser. Failure to ensure appropriate instructions (e.g., to declare the ice condenser inoperable at step 4.8) were included in 12 EHP 4030 STP.211 is an apparent violation of 10 CFR 50 Appendix B, Criterion V (EEI 50-315/98005-05(DRS); EEI 50-316/98005-05 (DRS)).

As of February 25, 1998, the licensee had not located an analysis to bound the unpinning of ice baskets authorized and performed during past surveillance testing. On February 25, 1998, the licensee notified the NRC of this potentially unanalyzed condition pursuant to the reporting requirements of 10 CFR 50.72(b)(2)(i).

b.2.3 Procedure Change Process not Followed

On December 1, 1997, the licensee completed 12 EHP 4030 STP.211, Revision 2 through steps 7.5 for Unit 2. Inspectors identified hand written changes in the left hand margin next to steps 7.1 through 7.5 on the completed copy of this procedure. These changes, signed and dated on December 1, 1997, incorporated the newly proposed TS 4.6.5.1 acceptance criterion for ice weight inventories. The licensee intended to use this change to meet the revised TS 4.6.5.1 acceptance criterion authorized by the NRC on January 2, 1998.

The licensee had made the change described above to the procedure acceptance criterion without following the change process described in procedure PMI-2010 “Instructions, Procedures, and Associated Indexes Policy,” Revision 24. Specifically, Section 4.6 of PMI-2010 required in part, the use of a procedure change sheet and a review by personnel holding a Senior Reactor Operating License, neither of which occurred in this case.

Failure to follow the procedure change process as described in PMI-2010 for changes made on December 1, 1997, to 12 EHP 4030 STP.211, Revision 2 is an example of an apparent violation of 10 CFR 50 Appendix B, Criterion V (EEI 50-315/98005-6a(DRS)).

On January 6, 1998, the licensee completed 12 EHP 4030 STP.211, Revision 2 through steps 7.5 for Unit 1. Inspectors identified hand written changes in the left hand margin next to steps 7.1 through 7.5 on the completed copy of this procedure. These changes, signed and dated January 6, 1998, incorporated the recently changed TS 4.6.5.1 acceptance criterion for ice weight inventories.

The licensee had made the change described above, to the procedure acceptance criterion, without following the change process described in procedure PMI-2010 “Instructions, Procedures, and Associated Indexes Policy,” Revision 24. Specifically, Section 4.6 of PMI-2010 required in part, the use of a procedure change sheet and a review by personnel holding a Senior Reactor Operating License, neither of which occurred

in this case.

Failure to follow the procedure change process as described in PMI-2010 for changes made on January 6, 1998 to 12 EHP 4030 STP.211, Revision 2 is an example of an apparent violation of 10 CFR 50 Appendix B, Criterion V (EEI 50-316/98005-6b(DRS)).

b.2.4 Nonrepresentative Selection of Ice Baskets

TS 4.6.5.1.b.2 required in part, that the licensee select a representative sample of 144 ice baskets for weighing from radial rows 1,2,4,6,8 and 9. A software computer program ICE-PICK is used by the licensee to randomly select a basket within each of the radial basket rows (1,2,4,6,8,9) to meet the "representative" ice basket selection required. However, this program excluded azimuthal rows 1,5 and 9 from the selection process and did not exclude baskets weighed during previous surveillance tests. The licensee reported that an average of at least 23 baskets were repetitively selected for the 1996 and 1997 surveillances used to calculate ice inventory for each Unit.

Historical data provided by the licensee, indicated that 223 Unit 1 and 171 Unit 2 ice baskets had never been weighed since original plant construction and start of commercial operation. These ice baskets were predominantly the azimuthal row 5 ice baskets. The licensee had excluded ice baskets in azimuthal rows 1,5 and 9 in their normal selection process, because of interference with intermediate deck door support structures, which are not normally removed due to the extensive restoration required. In August of 1997, the licensee selected and weighed a test sample of 54 Unit 2 ice baskets in azimuthal row 5 and identified "light" ice baskets (e.g., ice baskets containing less than 1333 lbs of ice). Of these baskets, 40 contained less than the current TS surveillance minimum 1333 lbs of ice and 13 of these baskets contained less than the preceding TS minimum of 1220 lbs of ice. The lightest azimuthal row 5 basket contained only 800 lbs of ice. Thus, the licensee's sampling process which excluded azimuthal row 5 ice baskets did not represent this population of "light" ice baskets.

Inspectors identified that percentages of ice baskets in radial rows 1 and 9 had not been weighed as frequently as baskets in other radial rows. From data taken since 1994 on Unit 1, an average of 48 percent of radial row 1 baskets and 51 percent of radial row 9 baskets had not been weighed. These percentages of unweighed baskets were significantly higher in row 1 and 9 than for any other radial row. Further, the ice baskets which had not been weighed recently in radial row 1 and 9 may correlate with ice baskets which had larger segments of missing ice in the lower part of the ice basket (Section M2.1.b.2). Thus, repetitive weighing of the same ice baskets in radial row 1 and 9 from one surveillance to the next, created a nonrepresentative sample, in that the potentially "light" nonweighed baskets with missing ice were not represented.

Based on the information discussed above, inspectors concluded that the licensee had been selecting a nonrepresentative sample of ice baskets when performing ice weight surveillances. The selected ice baskets constituted a nonrepresentative sample, in that azimuthal row 5 ice baskets were exclude, which were "lighter" than other azimuthal rows. Further, the selection was nonrepresentative in that the same ice baskets were repetitively weighed (particularly in radial rows 1 and 9) between sequential surveillances due to the failure to track and exclude previously weighed ice baskets. Failure to select a representative sample of ice baskets to weigh is an apparent violation of TS 4.6.5.1.b.2 (EEI 50-315/98005-07(DRS); EEI 50-316/98005-07 (DRS)).

The licensee had completed 12 EHP 4030 STP.211 on December 1, 1997 for Unit 2 and on January 6, 1998 for Unit 1. The licensee used these procedures to establish that ice inventory requirements for average bay group ice weight of 1333 lbs and total ice inventory met TS 4.6.5.1.b.2. However, these calculations of ice inventory did not include an adjustment for the recent data collected on "light" azimuthal row 5 baskets.

On February 11, 1998, the licensee notified the NRC (pursuant to requirements of 10 CFR 50.72(b)(2)(i)) that the ice weights used to determine TS compliance that may not constitute a representative sample and potentially represented an unanalyzed condition. The licensee also documented the concern as to whether the ice weights used to demonstrate TS compliance constituted a representative sample in CR 98-500.

b.2.5 Ineffective Control of Contractors

Damage to numerous Unit 1 and Unit 2 ice baskets had been documented in condition/problem reports CR 98-388, CR 97-3244, PR 88-914, CR 12-05-85-1036, CR 1-08-83-771 and CR 1-07-83-647. This ice basket damage, typically torn ice basket webbing, creased ice baskets and bent upper ice basket rims, potentially rendered the affected ice baskets unweighable or incapable of sustaining the original ice basket design loadings. The licensee attributed this damage to activities performed by contractors during the ice basket weighing surveillance test.

Historically, the licensee had used contractor services to perform the ice basket weighing for surveillance procedure 12 EHP 4030 STP.211 (formerly 12 THP 4030 STP.211). 10 CFR 50 Appendix B, Criterion VII requires in part, that the licensee assess the quality by contractor services at intervals commensurate with the nature of the work. In this case, the licensee controls were ineffective to assess and control the quality of work performed by contractors performing the ice basket weighing surveillance testing. As a consequence of this failure, a large number of ice baskets had sustained damage over many years, some of

which put ice baskets outside the original design basis. Failure to adequately assess the control of quality for contractor services for ice condenser surveillance testing is an apparent violation of 10 CFR 50 Appendix B, Criterion VII (EEI 50-315/98005-08(DRS); EEI 50-316/98005-08(DRS)).

b.3 Ice Basket Inspection Surveillance Testing

b.3.1 TS Requirement for Ice Basket Inspection not Met

TS surveillance requirement 4.6.5.1.d required in part, that the licensee visually inspect accessible portions of at least two ice baskets from each 1/3 of the ice condenser and verify that the ice baskets are free of detrimental wear, cracks, corrosion or other damage. A visual inspection of the accessible portions of the lower basket assembly was not required by 12 EHP 4030 STP.212 "Ice Condenser Basket Inspection," Revision 0.

On March 21, 1997, the licensee completed 12 EHP 4030 STP.212 "Ice Condenser Basket Inspection," Revision 0 for Unit 1. This inspection included a visual examination to identify damage on six ice baskets in accordance with TS 4.6.5.1.d requirements. During this inspection, ice basket 6-3-4 was visually examined, found free of damage and returned to service. However, on February 14, 1998, the licensee identified that Unit 1 ice basket 6-3-4 had a 3 inch by 8 inch dent in the webbing 1 foot above the bottom of this basket and a missing sheet metal screw in the bottom basket rim.

The damage identified on February 14, 1998, for ice basket 6-3-4 had not been identified during the prior surveillance test, because 12 EHP 4030 STP.212 did not include an inspection requirement for the lower ice basket area. Further, based on a scoping test completed by the licensee on a dented/buckled basket on February 12, 1998 (Section M2.1.b.3), the dented webbing could potentially decrease the compressive strength of this basket below the original design strength of a new basket. Thus, the licensee failed to identify potentially detrimental damage in ice basket 6-3-4 during the March 21, 1997 inspection as required by TS 4.6.5.1.d. Failure to include requirements in 12 EHP 4030 STP.212 to perform inspection of accessible areas of the lower ice basket is an apparent violation of TS 4.6.5.1.d (EEI 50-315/98005-09(DRS); EEI 50-316/98005-09(DRS)).

b.4 Ice Condenser Door Surveillance Testing

b.4.1 Lack of Margin For Ice Condenser Door Surveillance Acceptance Criterion

The door operability acceptance criteria were at the maximum values allowed by TS 4.6.5.3 in procedures 12 EHP 4030 STP.207 "Ice Condenser Lower Inlet Doors," Revision 0 and 12 EHP 4030 STP.245 "Inspection of Ice Condenser Intermediate Deck Doors," Revision 0. A margin for error associated with the measurement uncertainty in performing the door surveillance testing had not been incorporated into the acceptance criteria used in these procedures.

Surveillance procedure 12 EHP 4030 STP.207 specified a lower ice condenser door maximum opening torque of 675 inch-pounds and 195 inch-pounds (at 40 degrees open). These values did not account for surveillance measurement errors, which when considered would result in acceptance criteria in excess of the limits specified in TS 4.6.5.3.1.b item 1

and 2. Failure to adequately incorporate the acceptance limits specified by TS 4.6.5.3.1.b item 1 and 2 into 12 EHP 4030 STP.207 is an apparent violation of 10 CFR 50 Appendix B, Criterion XI (EEI 50-315/98005-10(DRS); EEI 50-316/98005-10 (DRS)).

Surveillance procedure 12 EHP 4030 STP.245 specified ice condenser intermediate deck door maximum opening resistance forces of 37.4 lbs, 33.8 lbs, 31.8 lbs and 31.0 lbs. These values did not account for surveillance measurement errors, which when considered would result in an acceptance criterion in excess of the limits specified in TS 4.6.5.3.2.b. Failure to adequately incorporate the acceptance limits specified by TS 4.6.5.3.2.b into 12 EHP 4030 STP.245 is an apparent violation of 10 CFR 50 Appendix B, Criterion XI (EEI 50-315/98005-11(DRS); EEI 50-316/98005-11 (DRS)).

b.4.2 NRC inspection report 50-369/97-16; 50-370/97-16 documented that 10 of 48 lower ice condenser inlet doors had failed to meet TS surveillance requirements for opening torque and were therefore rendered inoperable at the McGuire facility Unit 2. This problem was caused by the door flashing dragging against the floor. The floor had been raise 0.75 inches above the original grade level, due to freeze thaw cycles which introduced water into the concrete flooring.

For D.C. Cook, the licensee staff stated that the ice beds had never been "melted out" and thus water had not been introduced into the lower wear slab. No condition reports had been issued that documented a lower inlet door surveillance failure attributed to this condition nor were any visual indications present to indicate ice condenser floor movement. Thus, inspectors concluded that this problem had not occurred at D.C. Cook.

c. Conclusions on Surveillance Testing

Inspectors identified eight apparent violations of 10 CFR 50 Appendix B (three Criterion V, four Criterion XI, and one Criterion VII) and two apparent violations of TS. These violations pertained to inadequate instructions, inadequate acceptance limits, inadequate control of contractors, failure to implement TS requirements and entry into an unanalyzed condition for ice condenser surveillance testing. Further, two examples of an apparent violation of 10 CFR 50 Appendix B, Criterion V were identified for the licensee's failure to follow the procedure change process for changes made to completed surveillance tests. Collectively, these apparent violations represent a breakdown in the surveillance testing program for the ice condenser and contributed to a questionable state of operability for the as-found condition of the ice condenser.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Ice Condenser Materiel Condition

a. Inspection Scope (62700)

Inspectors performed walkdowns of the ice condenser for each Unit, to evaluate the materiel condition.

b. Observations and Findings

b.1 Blocked Ice Bed Flow Passages

Areas between ice baskets (flow passages) allow steam released in a loss of coolant accident to travel through the ice bed and condense which reduces the post accident containment pressure. On January 22, 1998, inspectors identified multiple flow passages obstructed by ice in Unit 2. As a corrective action for this finding, the licensee initiated an inspection of flow passages in every bay of both Units to identify blockage.

On January 27, 1998, the licensee identified blocked flow passages in every bay for both Units and estimated that 10 to 20 percent of the ice condenser flow passage area was blocked by ice. The plant design basis analysis (Westinghouse WCAP-11902 "Reduced Temperature and Pressure Operation for Donald C. Cook Nuclear Plant Unit 1 Licensing Report" dated October 1988) had assumed 15 percent of the flow passage area blocked in groups of ice bays. The licensee declared the ice condensers inoperable on January 28, 1998 and documented the condition in CR 98-0326. Both Units were in cold shut down at the time and the ice condenser operability was not required until hot plant operation (e.g., Modes 1-4). These blocked passages likely existed during past plant operation and had not been identified due to inadequate surveillance testing (Section M1.1.b.1.1).

On January 28, 1998, the licensee notified the NRC (pursuant to requirements of 10 CFR 50.72(b)(2)(i)) of the blocked ice condenser flow passages, that potentially represented an unanalyzed condition. Because of this condition and other unanalyzed conditions identified herein, the licensee staff reportedly intended to complete a detailed analysis to demonstrate that the ice condenser was capable of performing its design function during previous operating periods (Section E7.2).

b.2 Missing Ice Segments in Lower Sections of Ice Baskets

The TS 4.6.5.1 basis for operability of the ice condenser assumed that ice is evenly distributed through the containment bays. Inspectors performed a sample inspection of portions of several bays in the Unit 1 and 2 lower ice condenser and identified ice baskets with missing ice segments (6 to 18 feet in height). The predominant number of ice baskets with larger missing ice segments appeared to exist for ice baskets in radial rows 8 and 9. Inspectors reviewed the dates when the licensee had last weighed four Unit 2 ice baskets (in radial rows 8 and 9) with 12 feet or more of missing ice. Of these four Unit 2 ice baskets, two had not been weighed in over 10 years and two had no recorded weight since the beginning of plant operation. Ice baskets are not refilled unless they are weighed and found to be "light." Thus, ice baskets not recently weighed with observed missing ice segments were potentially "lighter" than the average basket weights specified by the TS. Further, light ice baskets potentially affected the assumption that the ice was evenly distributed through ice condenser bays and impacted the methodology used to select a representative sample of ice baskets for weighing (Section M1.1.b.2.4).

As a corrective action for the missing ice segments, the licensee performed a visual inspection of the lower segments of all accessible ice baskets and identified missing ice segments in every bay. On February 11, 1998, the licensee documented in CR 98-500 that radial row 8, 9 and azimuthal row 5 ice baskets showed visual evidence of ice loss due to sublimation. The sublimation of ice in the ice condenser has been demonstrated to be less than five percent per year. Thus, the ice baskets with significant missing ice segments (as discussed above) had developed over many years without identification or evaluation by system engineers or other members of the licensee staff during ice condenser walkdowns. The ice condenser performs a passive safety function and licensee staff reported that the

ice condenser historically had not been considered a “system.”

The licensee is required by 10 CFR 50 Appendix B, Criterion XVI, to establish measures to ensure that conditions adverse to quality are promptly identified and corrected. In this case the licensee had failed to promptly identify, evaluate or implement corrective actions for the missing ice segments, which is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-12(DRS); EEI 50-316/98005-12(DRS)).

b.3 Dented/Buckled Ice Basket Webbing Condition is Outside the Design Basis

An ice basket profile roundness tolerance (reference WCAP 8887 and 8304) is specified for basket fabrication. Changes to the basket roundness profile potentially affect the ability of the ice basket to sustain a compressive load. Under design basis accident conditions the ice baskets are subject to compressive loadings.

On February 4, 1998, the inspectors identified seven Unit 2 ice baskets with a six-inch long horizontal crease or buckled area of webbing approximately 1 foot above the bottom of the basket. This buckled webbing changed the ice basket roundness profile and potentially affected the ice basket design compressive strength. As a corrective action, the licensee included a search for dented/crumpled ice baskets in the inspections of all accessible lower basket assemblies in each unit to identify missing screws. From this inspection, the licensee generated a preliminary list of damaged baskets. In excess of 40 Unit 1 baskets and in excess of 100 Unit 2 baskets were identified with dents or buckled/crushed areas in the lattice webbing near the bottom of the basket.

The licensee staff stated that the likely cause of the dented/buckled damaged to the ice baskets was dropping of the baskets, or jacking the baskets from below, in an attempt to loosen the baskets for surveillance testing. Based on observed corrosion at buckled webbing locations (protective coating was damaged) and the number of damaged ice baskets, the inspectors concluded that the damage had occurred over an extended period of time. Further, these dented/buckled ice baskets were readily visible and yet this damage had heretofore not been identified during ice condenser walkdowns by system engineers.

In this instance, the licensee staff had numerous opportunities to identify and correct the dented baskets during past surveillance testing or ice condenser walkdowns. Failure to promptly identify, evaluate or implement corrective actions for the Unit 1 and 2 ice baskets with dented/buckled webbing located near the bottom ice basket rim assembly, is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-13(DRS); EEI 50-316/98005-13(DRS)).

On February 12, 1998, the licensee conducted a scoping test on a Unit 1 ice basket, which contained a dented/buckled section of webbing approximately 1 foot above the bottom of the basket. This test was intended to apply a compressive axial and lateral load equivalent to that used to qualify the design basis (dead load combined with operational basis earthquake) of an undamaged basket (reference WCAP 8304). This basket began to fail with plastic deformation (crumple) under a compressive load of less than half that used to qualify the design of an undamaged basket. On February 12, 1998, the licensee notified the NRC (pursuant to reporting requirements of 10 CFR 50.72(b)(2)(i)) that this ice basket, represented a condition outside the plant’s design basis.

b.4 Unidentified Nonencapsulated Insulation

Section 3.1.6 “Loose Insulation” of Appendix M of the FSAR discusses the use of an airtight polyethylene bag to encapsulate insulation, to prevent loose insulation during a DBA. Loose insulation could be returned to the sump and potentially clog emergency core cooling system suction strainers following a DBA.

On February 19, 1998, inspectors identified a blanket of “loose” (nonencapsulated) fiberglass insulation between the entry doorway bulkhead and the bay 24 east wall in the Unit 1 lower ice condenser. Inspectors estimated that this nonencapsulated insulation was potentially a 10 feet by 10 feet piece of fiberglass insulation with cutouts for the door and structural support materials. This condition had likely existed since original plant construction. On February 20, 1998, the licensee issued CR 98-0634 to document and evaluate this condition applicable to both Units.

In this instance, the licensee staff had numerous opportunities to identify and evaluate the nonencapsulated insulation during past surveillance testing or ice condenser walkdowns. Failure to promptly identify, evaluate or implement corrective actions for the nonencapsulated insulation in the Unit 1 and 2 ice condensers, is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-14(DRS); EEI 50-316/98005-14(DRS)).

b.5 Unweighable Ice Baskets with Torn, Creased, Dented, or Buckled Webbing Damage

Inspectors noted torn ligaments, bent rims and missing screws at the upper rim area of ice basket assemblies. The licensee had previously identified (reference CR 2-12-88-1719 and CR 1-04-89-702) in excess of 200 Unit 2 ice baskets and in excess of 300 Unit 1 ice baskets with damage to upper areas of ice baskets (predominantly torn webbing and bent rims). In some cases, this damage to the upper rim areas prevented the use of test equipment to lift the ice basket for the ice basket weight surveillance, which rendered the ice basket unweighable.

The licensee could not readily identify the damaged ice baskets in service that had been rendered unweighable, because this type of information was not tracked. The licensee initiated actions to visually inspect and map the ice baskets still in service with damage near the upper rim areas.

The licensee stated that the probable cause of the ice basket damage in upper areas of the basket was rough handling (e.g., attempts to free baskets frozen in) during past surveillance weighing activities (M1.b.2.5.). Inspectors identified that damaged unweighable ice baskets in radial rows 1,2,4,6,8,9 could affect the ability of the licensee to perform representative sampling of ice baskets (Section M1.b.2.4). Inspectors identified that during the April 24, 1996 performance of EHP 4030 STP.211 for Unit 2, sixteen radial row nine and ten radial row one ice baskets could not be weighed due to damaged rims or being frozen in. Additionally, unweighable baskets cannot be refilled without repairs, since baskets loaded without subsequent weighing could potentially exceed the maximum allowable ice basket weights assumed in the design basis analysis.

b.6 Ice Form Different Than as Described in the FSAR

Section 1.1 of the FSAR, Appendix M, described the form of ice used to fill the ice baskets as 2 inch by 2 inch by 1/8 inch flake ice. Further, Section 5.3.3 of the FSAR stated that long-term ice storage tests have shown that the ice can be stored without significant weight loss or physical distortion. Contrary to this description, inspectors observed that ice baskets recently filled contained a course loose granular form of ice and that ice baskets not recently filled had sublimated into a solid mass of ice.

To address this change in ice form, the licensee provided a letter from Westinghouse dated February 10, 1998, which referenced Westinghouse testing conducted in 1960 that tested ice in the form of chips, cubes, blocks and spheres. These tests reportedly demonstrated that ice condenser performance was insensitive to extreme changes in ice heat transfer surface area. Additionally, a 1973 Westinghouse test was referenced which included 0.75 lbs of water per foot per basket. The water was added to represent the long term storage condition of the ice. The licensee also referenced the Atomic Energy Commission (AEC) questions and responses on this subject during the initial plant licensing. Licensee responses to the AEC for this concern included, “Ice storage

tests have shown that ice can be stored for long periods without significant degradation" and "Results of these tests show no significant difference in the properties of various forms of ice."

Based on the information discussed above, the existing changes in ice form appeared to be bounded by tests and evaluations reviewed during initial plant licensing. However, the licensee's failure to update the description of the ice form changes in the FSAR was considered an apparent violation of 10 CFR 50.71(e) requirements and is discussed in section E7.1.

c. Conclusions on Ice Condenser Materiel Condition

Inspectors identified three apparent violations of 10 CFR 50 Appendix B, Criterion XVI for the licensee's failure to identify conditions adverse to quality. Conditions not previously identified by the licensee in the ice condenser included: blocked flow passages, missing ice segments, dented/buckled basket webbing, unweighable ice baskets, and nonencapsulated insulation. Further, these conditions had existed for an extended period of time, without identification by system engineers or licensee staff.

Collectively, these problems contributed to a poor state of materiel condition in each ice condenser, such that the ability of the ice condenser to perform its design function was in question.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Corrective Actions for Ice Condenser Component Damage

a. Inspection Scope (92720)

Inspectors interviewed engineering staff and reviewed engineering corrective actions documented in problem/ condition reports for damaged ice condenser components.

b. Observations and Findings

b.1 Failed and Missing Ice Basket Sheet Metal Screws

b.1.1 Corrective Actions Process not Implemented for Ice Basket Sheet Metal Screws

Ice baskets segments (typically 12 feet in length) are coupled together using sheet metal screws arranged in pairs at 60 degrees intervals around the circumference of the ice basket. Twelve screws on each basket segment are installed at the coupling joint. Missing screws at the intermediate or lower coupling joints could allow an ice basket to separate and become a missile hazard under design basis accident loads. NRC

inspection report 50-390/97-04; 50-391/97-04 documented that broken ice basket sheet metal screws had been found in the ice melt tank at another ice condenser plant (Watts Bar).

For D.C. Cook, an ice condenser system engineer identified four ice basket sheet metal screw heads in the ice melt system filter on January 22, 1998. The licensee had not initially recorded these screws missing from ice baskets, nor others found in prior outages on condition reports. The system engineer estimated that approximately two dozen sheet metal screw parts had been found in the ice melt system filters since 1991. The licensee staff had believed that the source of these screws was the top basket rim or separated baskets, which had been restrained through modifications and thus had no safety significance. Inspectors' questions into the definitive source and significance of these missing sheet metal screws prompted a licensee inspection of ice baskets in each Unit for missing screws (Section E2.1.b.1.2). The licensee's failure to promptly identify and initiate corrective actions for the ice basket sheet metal screws found in the ice melt cleanup system filters during previous outages is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-15(DRS); EEI 50-316/98005-15(DRS)).

b.1.2 Unanalyzed Condition for Plant Operation with Missing Sheet Metal Screws

The scope of the licensee's ice basket inspection for missing sheet metal screws consisted of a visual inspection of accessible areas of the bottom basket coupling rings for ice baskets in both Units. The accessibility of the bottom basket coupling ring area of some ice baskets was limited by ice buildup or physical interferences with ice condenser components. For example, of the 81 ice baskets per bay, the licensee was not able to perform a complete inspection on up to 22 baskets per bay in Unit 2 and up to 18 baskets per bay in Unit 1. In addition to the bottom basket areas, the licensee performed a camera aided visual examination of the intermediate coupling joints and stiffening rings on ice baskets in each unit (a population of 60 to 100 baskets for each Unit was planned).

From the inspections discussed above, in excess of 40 Unit 1 and in excess of 90 Unit 2 ice baskets were identified with missing sheet metal screws at the lower ice basket coupling ring. In addition, several ice baskets had been identified to have one or two missing screws at intermediate coupling rings in the ongoing full length camera aided inspections.

The licensee had Westinghouse complete an evaluation (documented in a memorandum dated February 13, 1998) of the missing sheet metal screws. In this evaluation Westinghouse concluded that the ice basket column would continue to meet the design function (based on allowable shear stress in the sheet metal screws) with 8 of 12 screws on a basket segment at the coupling union on a case by case basis. At the

conclusion of the inspection period the licensee had identified the following ice baskets with more than 4 missing sheet metal screws at the bottom basket coupling ring.

Unit No.	Basket No. (Bay, Azimuthal Row, Radial Row)	No. Of Missing Screws
1	2-1-6	11 of 12
1	3-4-8	12 of 12
1	24-4-8	9 of 12
2	8-2-9	6 of 12
2	14-6-8	9 rivets and 3 screws
2	19-7-9	12 of 12
2	22-8-9	5 of 12

On February 14, 1998, the licensee notified the NRC (pursuant to requirements of 10 CFR 50.72(b)(2)(i)) that two Unit 1 baskets missing more than 4 sheet metal screws represented an unanalyzed condition outside the plant's design basis. At of the conclusion of the inspection period, the licensee had not determined the cause of the failed sheet metal screws.

b.2 Loose and Missing U-bolt Nuts

On November 2, 1990, the licensee documented in PR 90-1639 a broken U-bolt and 19 missing nuts from Unit 1 ice baskets and 12 missing U-bolt nuts from Unit 2 ice baskets. The cause of the missing fasteners was attributed to loosening of the nuts caused by vibrating tools used during the ice basket emptying process. Licensee corrective actions included replacing missing nuts and inspecting a selection of basket nuts to identify any loose or missing fasteners. Preventative actions included revising 12 THP 4030 STP.211 to require all baskets which are vibrated to be inspected for broken U-bolts, and loose or missing nuts.

On April 23, 1992, the licensee documented in PR 92-0360 that 10 percent of all Unit 2 U-bolt basket nuts were loose and 5 Unit 2 baskets had missing U-bolt nuts. Again, the cause of the loose fasteners was attributed to vibrating tools used during ice basket emptying.

On August 19, 1992, the licensee identified in PR 92-1386, missing nuts and an unspecified number or percentage of loose nuts for Unit 1. The cause of the loose and missing nuts was documented as unknown. The preventative action was to continue to do inspection of nuts during 12 THP 4030 STP.211.

Step 4.17 of EHP 4030 STP.211 (formerly 12 THP 4030 STP.211) allowed replacing loose or missing fasteners from the bottom ice basket U-bolts without restrictions or instructions. Step 5.4.3.3 required missing or broken U-bolts to be documented on a condition report and Attachment 4 of this procedure. However, this step only required documenting loose nuts in Attachment 4, vice on a condition report. Thus, inspectors were concerned that

loose U-bolt nuts could be an ongoing problem for a number of ice baskets and not identified in condition reports.

Loose or missing U-bolt nuts can allow the ice baskets to be displaced horizontally under design basis accident loads such that other baskets may be contacted and damaged. The licensee's preventative actions implemented in PR 90-1639 did not prevent recurring loose and missing U-bolt nuts. Further, existing surveillances requirements did not require repeat occurrences of this condition adverse to quality to be entered into the corrective action process. Failure to implement corrective actions which preclude recurrence of this significant condition (loose U-bolt nuts) adverse to quality is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-16(DRS); EEI 50-316/98005-16(DRS)).

b.3 Separated Ice Baskets

In 1983, the licensee identified separation of sections of the Unit 1 ice baskets 17-2-9 , 20-6-8 and 20-8-8 and documented this condition in CR 1-07-83-647 and CR 1-08-83-771. The bay 20 ice baskets had failed during weighing activities with less than 1000 lbs of lifting force applied. This amount of force was below the design forces for the basket and the licensee had not determined the cause for these basket section failures in response to these condition reports.

On February 28, 1997, during surveillance testing, the top three feet of ice basket 20-9-8 had separated. The licensee documented this condition in CR 97-554, and did not identify a definitive cause, nor implement preventative actions for this condition.

These ice baskets, which failed below the design loadings, could have separated under DBA blowdown loadings and become missile hazards. Failure to implement corrective actions for these separated Unit 1 ice baskets, which precluded repetition of this significant condition adverse to quality, is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-17(DRS)).

b.4 Failed Fillet Welds at the Ice Basket Bottom Hold Down Bar

On July 22, 1992, the licensee had identified 22 Unit 1 and 3 Unit 2 ice baskets which had settled (bottom rim displaced relative to the hold down bar) and documented this condition in PR 92-1181. Two ice baskets had been removed to examine the inner bottom basket rim area, which was not directly accessible to an in-situ examination. This examination revealed that the fillet weld joining the bottom basket (½ inch by 4 inch by 11.6 inch) hold down bar had failed allowing separation of this bar from the bottom basket rim.

The cause of these weld failures was determined to be manufacturing induced flaws, vice service induced. The metallurgical report (Gelles Laboratories, Inc. dated August 1992) conclusions stated "No evidence of service caused failure was found" and "..the galvanizing operation may not have been done correctly" and "The lack of fusion appears to be caused by improper joint cleaning." Further, this report had recommended that the licensee perform mechanical testing of selected ice baskets to ascertain the capability of these baskets.

The licensee's corrective actions for the known (settled) ice baskets with failed fillet welds

included installing restrainer bars over the failed Unit 2 baskets and replacing the bottom rims for the Unit 1 baskets. However, corrective actions documented in PR 92-1181 did not include identification of the full scope of ice baskets with failed fillet welds caused by manufacturing defects. The licensee chose not to attempt to identify other ice baskets with flawed/failed fillet welds due to in-situ accessibility limitations. Instead, the licensee performed analyses and evaluations to accept this condition.

In a licensee memorandum dated July 27, 1992, the licensee evaluated the effect of the broken fillet welds on the ice basket during a DBA. In this evaluation, the licensee stated in part, that the stiffness of the end grid is several orders of magnitude lower than the stiffness of the bottom rim and of the ½ inch bar, causing it to deflect out of the way during a DBA uplift condition and causing the bar to engage the lower rim inner lip with minimal displacement and no impact. The evaluation success criteria established by the licensee were that bending and shear stresses of the bottom rim would remain within allowable values for the material. Based on this evaluation, the licensee concluded that the ice baskets could resist all loads despite the broken welds.

On July 27, 1992, Westinghouse expressed a concern pertaining to the dynamic effects of a DBA blowdown on baskets with broken welds that had settled. For baskets in a settled position, the lip of the bottom rim of the basket would be subject to additional loads due to the impact on the ½ inch bar as the baskets is accelerated upwards by the blowdown forces generated by the DBA. Westinghouse could not provide reasonable assurance that the settled baskets would not become missile hazards when subject to a DBA plus design basis earthquake loads.

On August 13, 1992, the licensee performed another evaluation and developed a mathematical model of the dynamics of the ice basket loadings to address the Westinghouse concern discussed above. The licensee reportedly incorporated the blowdown loads provided by Westinghouse and the displacement load/resistance curves (developed from a single static pull test performed on August 8, 1992) into their mathematical model of dynamic loads. For the design ice basket weights, the model reportedly established: whether the bottom basket rim assembly would stop the motion of the dropped baskets, how much displacement is required, what residual capacity of the assembly is to resist static blowdown forces and the dynamic forces on the support structure. Based on the results of this test and calculation of kinetic energy to which the baskets could be exposed, the licensee concluded that ice baskets would not become missile hazards.

The FSAR Appendix M, Section 3.1.4 provided the original design criterion and load factors for the ice baskets. The licensee testing and analysis had accepted plastic deformation (displacement) of the ice basket bottom rim assembly without applying design bases lateral loads, which was outside the original ice basket design basis described in Appendix M of the FSAR. Further, the licensee analysis incorporated the results from a single load test, which may not represent the bounding case, nor provide an adequate statistical design basis. Section 3.1.5 of Appendix M required in part, that the licensee obtain AEC (now NRC) approval for analysis criterion other than previously accepted by the AEC in Section 3.1.4 of Appendix M. As of February 27, 1998, the licensee had not submitted their July 27 and August 13, 1992 analysis for ice baskets with failed fillet welds to the NRC for evaluation.

Inspectors concluded that as of February 27, 1998, the licensee had not taken adequate corrective actions as discussed above for this condition adverse to quality. Specifically, the licensee failed to apply the applicable FSAR design criteria or seek NRC approval of the alternative analysis used in the engineering evaluation (dated July 27 and August 13, 1992) that accepted the affected ice baskets. Failure to implement adequate corrective actions for this condition (ice baskets with flawed/failed fillet welds) adverse to quality is an apparent violation of 10 CFR 50 Appendix B, Criterion XVI (EEI 50-315/98005-18(DRS); EEI 50-316/98005-18(DRS)).

In a letter dated August 31, 1992, the licensee documented that a four hour event notification pursuant to 10 CFR 50.72(b)(2)(i) requirements was made on August 4, 1992 for the ice baskets found in this condition. In this letter the licensee also stated "Since duplicate reporting is discouraged by the NRC, a separate Part 21 Notification was not made." The licensee concluded that their analysis demonstrated that the baskets with degraded welds would not become missile hazards and thus, this condition was not reportable and recommended retraction of the NRC notification made on August 4, 1992. However, as discussed above, this condition was outside the original design basis for the ice baskets and the 10 CFR 50.72 event notification appeared valid. Thus, for the failed basket welds caused by manufacturing defects, inspectors were concerned that 10 CFR 50.72 and 10 CFR 21 reporting requirements had not been properly evaluated. Inspectors considered this an unresolved item pending review of the licensee basis of the applicability of these requirements to this issue (URI 50-315/98005-19(DRS); URI 50-316/98005-19(DRS)).

c. Conclusions on Corrective Actions for Ice Condenser Components

Inspectors identified four apparent violations of 10 CFR 50 Appendix B, Criterion XVI, for the licensee's failure to identify and correct conditions adverse to quality on ice condenser components. Specifically, these violations pertained to the licensee's failure to: implement prompt corrective actions for missing ice basket sheet metal screws, implement effective corrective actions to prevent recurrence of loose U-bolt nuts and separated ice baskets, and take appropriate corrective actions for the ice baskets with defective hold down bar welds. Collectively, the corrective action violations identified in Sections M2.1 and this section represent a breakdown in the corrective action program for the ice condenser.

Additionally, the inspectors identified an unresolved item pertaining to the licensee's application of 10 CFR 50.72 and 10 CFR 21 reporting requirements associated with the failed basket hold down bar fillet welds.

E7 Quality Assurance in Engineering Activities

E7.1 Maintenance of the Ice Condenser Design Basis

a. Inspection Scope (37700)

Inspectors reviewed select analyses and modifications made to ice condenser components since original construction and reviewed the current description of the ice condenser in Section 5.3.3 and Appendix J and M of the FSAR.

b. Observations and Findings

b.1 Design Basis for Ice Condenser not Updated

10 CFR 50.71(e) requires in part that the licensee periodically update the FSAR as originally submitted in the application for an operating license. Appendix J and M of the FSAR were submitted as part of the FSAR in the original license application for D.C. Cook. Inspectors identified that these appendices had not been updated over the life of the plant. The licensee issued CR 98-0444 to document the failure to update the FSAR, Appendix M.

The cover page for Appendix J and M of the FSAR stated that "The appendix is presented as information current during the OL [Operating License] review, and is reproduced as an historical record." These appendices contained the detailed original design description and analysis for the ice condenser. Due to the licensee's failure to maintain these appendices current, the design basis and descriptions of ice condenser components had become out of date. Inspectors identified specific analysis and modifications affecting the design basis or original ice condenser component descriptions, which had not been incorporated into Appendix J or M of the FSAR as discussed below.

b.1.1 WCAP-11902 "Reduced Temperature and Pressure Operation for Donald C. Cook Nuclear Plant Unit 1 Licensing Report," dated October 1988, was used as the basis to establish an upper allowable limit for ice condenser flow passage blockage, which the licensee incorporated into 12 THP 4030 STP.211 (currently 12 EHP 4030 STP.211). As of February 27, 1998, the analysis limits established in WCAP 11902 for the ice condenser had not been incorporated into Appendix M or J of the FSAR. Failure to incorporate ice condenser flow passage blockage limits as established in WCAP-11902 into the FSAR is an apparent violation of 10 CFR 50.71(e) (EEI 50-315/98005-20(DRS); EEI 50-316/98005-20(DRS)).

b.1.2 The FSAR, Appendix M, Figure 6.4.1 details the configuration of the ice basket bottom rim assembly. A bolted rectangular tube support is depicted in this drawing, vice the as-built solid hold down bar support attached with fillet welds for ice baskets in the plant. As of February 27, 1998, the licensee has not updated Figure 6.4.1 to match the as-built configuration. Failure to update the FSAR to incorporate the as-built ice basket configuration is an apparent violation of 10 CFR 50.71(e) (EEI 50-315/98005-21(DRS); EEI 50-316/98005-21(DRS)).

b.1.3 The FSAR, Appendix M, Section 1.1 described the form of ice used to fill ice baskets as 2 inch by 2 inch by 1/8 inch flake ice. Further, Section 5.3.3 of the FSAR stated that long-term ice storage tests have shown that the ice can be stored without significant weight loss or physical distortion. Contrary to this description, since the beginning of commercial operation, the ice baskets have been refilled with ice in course granular form, which had sublimated into a solid mass of ice for baskets not recently filled. As of February 27, 1998, the licensee has not updated these FSAR sections to reflect the actual form of ice used. Failure to update the description of the ice form in the FSAR to match the as-used ice form is an apparent violation of 10 CFR 50.71(e) (EEI 50-315/98005-22(DRS); EEI 50-316/98005-22(DRS)).

b.1.4 The licensee modified a Unit 2 ice basket 2-3-8 in February of 1989, by adding 4 pipe structural supports and a cable under modification 02-MM-032. As of February 27, 1998, the licensee had not updated the ice basket descriptions in Appendix M of the FSAR to identify this modified Unit 2 ice basket. Failure to update the FSAR descriptions for this modified ice basket is an apparent violation of 10 CFR 50.71(e) (EEI 50-316/98005-23(DRS)).

b.1.5 The licensee modified Unit 1 ice baskets 12-2-4, 12-8-4, 14-7-8, 3-3-9, 1-7-9, 13-7-9, 16-7-9 and 18-7-9, in July of 1989 by adding 4 pipe structural supports and a cable to each ice basket under modification 01-MM-048. As of February 27, 1998, the licensee had not updated the ice basket description in Appendix M of the FSAR to identify these modified Unit 1 ice baskets. Failure to update the FSAR descriptions for this modified ice basket is an apparent violation of 10 CFR 50.71(e) (EEI 50-315/98005-24(DRS)).

b.1.6 Westinghouse letter "Indiana Michigan Power D.C. Cook Nuclear Power Plant Ice Condenser Seismic Load Study New Ice Basket Design," dated February 28, 1990, was used as the basis to establish the maximum gross basket weight limit of 1877 lbs, which the licensee incorporated into 12 THP 4030 STP.211 "Ice Condenser Surveillance" (currently 12 EHP 4030 STP.211). As of February 27, 1998, the licensee had not updated data in table 4.3-1 of Appendix M of the FSAR, that reflect a maximum analyzed gross ice basket weight limit of 1776 lbs. Failure to update the FSAR sections to incorporate the revised maximum analyzed gross ice basket weight is an apparent violation of 10 CFR 50.71(e) (EEI 50-315/98005-25(DRS); EEI 50-316/98005-25(DRS)).

b.1.7 On October 14, 1992, the licensee authorized the use of Westinghouse drawings 1851E35, Revision 7 and 1880E22, Revision 6 to construct replacement ice baskets from short 2 or 3-foot segments, vice the original 12-foot segments described in Appendix M of the FSAR. This change in ice basket design resulted in a heavier ice basket with more coupling joints and sheet metal screws. As of February 27, 1998, the licensee failed to revise the FSAR, Appendix M, to incorporate the change made to replacement Unit 1 and 2 replacement ice baskets fabricated from short ice basket subassemblies (2 or 3-foot segments). Failure to update the FSAR to incorporate the replacement ice basket design is an apparent violation of 10 CFR 50.71(e) (EEI 50-315/98005-26(DRS); EEI 50-316/98005-26(DRS)).

b.2 Unauthorized Modification of Ice Basket Assemblies

Inspectors identified modifications to Unit 1 and Unit 2 ice baskets which had been installed

without following established design control processes.

Between February 14 through 17, 1998, licensee staff conducted inspections of accessible areas of the lower ice basket to identify damage and nonconforming conditions in response to missing screws and other basket damage discussed herein. From a preliminary list of damaged baskets created by licensee staff during this inspection, the inspectors identified and visually confirmed unauthorized modifications made to Unit 1 and Unit 2 ice baskets as discussed below.

b.2.1 On February 19, 1998, inspectors identified that Unit 1 ice baskets 4-1-9, 5-9-1 and 20-3-6 had a galvanized bolt installed in place of the clevis pin that connected the ice basket to the support structure. The licensee was unaware of when this modification was installed, since it had not been authorized. Failure to follow established design control processes for this modification to these ice baskets is an apparent violation of 10 CFR 50 Appendix B, Criterion III (EEI 50-315/98005-27(DRS); EEI 50-316/98005-27(DRS)).

b.2.2 On February 19, 1998, inspectors identified that Unit 2 ice basket 1-7-9 had a six inch wide curved sheath of sheet metal installed onto the ice basket mesh, beginning just above the bottom of the ice basket and running vertically upwards as far as could be seen (greater than 12 feet). The licensee was unaware of when this modification was installed, since it had not been authorized. Failure to follow established design control processes for this modification to ice basket 1-7-9 is an apparent violation of 10 CFR 50 Appendix B, Criterion III (EEI 50-315/98005-28(DRS); EEI 50-316/98005-28(DRS)).

b.2.3 On February 19, 1998, inspectors identified that Unit 2 ice basket 14-6-8 had 9 rivets installed in place of sheet metal screws in the bottom ice basket rim coupling. The licensee was unaware of when this modification was installed, since it had not been authorized. Failure to follow established design control processes for this modification to ice basket 14-6-8 is an apparent violation of 10 CFR 50 Appendix B, Criterion III (EEI 50-315/98005-29(DRS); EEI 50-316/98005-29(DRS)).

At the conclusion of the inspection period, the licensee had not determined the potential safety consequences for past plant operation with these unauthorized modifications.

b.3 Surveillance Procedure Used to Modify and Remove Ice Basket Cruciform Supports

The ice basket cruciform supports attach to the coupling and stiffening ring locations (at six foot intervals) and prevent ice in the baskets from displacing axially in the event of a loss of ice by sublimation or due to accident conditions.

On November 18, 1988, the licensee initiated a modification RFC-DC-12-1937 to change the design or remove cruciform supports from ice baskets in Unit 1 and Unit 2. A licensee letter dated January 31, 1990, documented that drawings for ice baskets modified in this manner would not be updated because these drawings were not retained by the licensee and the drawings in this modification package would serve as the permanent plant record for the affected ice baskets.

After closure of RFC-DC-12-1937, the licensee changed Attachment 4 and 5 of 12 EHP 4030 STP.211 (formerly 12 THP 4030 STP.211) to authorize changing basket cruciforms or deletion of cruciforms. Specifically, Attachment 4 and 5 of this procedure allowed deletion of the bottom three cruciforms from Radial row 7, 8 or 9 ice baskets and/or the installation of replacement cruciforms of a new design. These modifications were not required to be updated on the ice basket drawings.

On February 3, 1998, the inspectors requested a list of all baskets with cruciform supports that had been deleted or modified during performance of 12 EHP 4030 STP.211. As of February 27, 1998, the licensee was unable to compile a list of ice baskets modified under 12 EHP 4030 STP.211, due to the extensive resources required to review the previous surveillance test data to identify the modified ice baskets.

The inspectors concluded that the open ended modification process authorized in 12 EHP 4030 STP.211, did not ensure that updated drawings were maintained for the specific ice baskets with deleted or modified cruciform supports. 10 CFR 50 Appendix B, Criterion III requires in part that controls will be in place to ensure that modifications are controlled.... In this case the licensee chose not to maintain current drawings of ice baskets with the modified cruciform design. Further, the use of a surveillance procedure to perform modifications was outside of the licensee's established design control process. Failure to follow the existing design control processes in modification of ice basket cruciforms is an apparent violation of 10 CFR 50 Appendix B, Criterion III (EEI 50-315/98005-30(DRS); EEI 50-316/98005-30(DRS)).

c. Conclusions on the Maintenance of the Ice Condenser Design Basis

Inspectors identified seven apparent violations of 10 CFR 50.71(e) pertaining to the licensee's failure to update the FSAR Appendices J or M which contained the detailed description and design basis for the ice condenser. Additionally, inspectors identified four apparent violations of 10 CFR 50 Appendix B, Criterion III, pertaining to the licensee's failure to follow the established design control process for ice basket modifications. Collectively, these apparent violations represent a programmatic breakdown in the maintenance of the design basis for the ice condenser.

E7.2 Operability in Question for the As-Found Ice Condenser Condition

The ice condenser was degraded to a poor state of materiel condition, such that the

operability of the ice condenser was in question (Section M2.1). The licensee had issued a condition report 98-0388 to document all damage to ice baskets, including damage previously identified. As part of the investigation for this condition report, the licensee had reportedly contracted with Westinghouse to undertake an assessment of the overall ice condenser operability for the as-found condition of the ice condenser. Pending review of the licensee's evaluation of past plant operation with the ice condenser in the as-found state, inspectors considered this an unresolved item (URI 50-315/98005-31(DRS); URI 50-316/98005-31(DRS)).

E8 Miscellaneous Engineering Issues(92700)

E8.1 (Closed) Licensee Event Report (LER) 50-315/98004-00: Interim LER- Restricted Ice Condenser Flow Passages Found to Constitute an Unanalyzed Condition, issued February 23, 1998.

This issue was reported to the NRC on January 22, 1998, pursuant to requirements of 10 CFR 50.72(b)(2)(i) and is discussed in Sections M1.1.b.1 and M2.1.b.1. The impact of this condition on the as-found condition of the ice condenser for past plant operations will be assessed by the licensee and tracked by the NRC in resolution of an unresolved item (URI 50-315/98005-31(DRS); URI 50-316/98005-31(DRS)). Therefore, this LER is closed.

E8.2 (Closed) Licensee Event Report (LER) 50-315/98005-00: Interim LER- Lack of Adequate Number of Screws in Ice Basket Coupling Rings Determined to Constitute Unanalyzed Condition, issued February 23, 1998.

This issue was reported to the NRC on February 14, 1998, pursuant to requirements of 10 CFR 50.72(b)(2)(i) and is discussed in Section E2.1.b.1.2. The impact of this condition on the as-found condition of the ice condenser for past plant operations will be assessed by the licensee and tracked by the NRC in resolution of an unresolved item (URI 50-315/98005-31(DRS); URI 50-316/98005-31(DRS)). Therefore, this LER is closed.

E8.3 (Closed) Licensee Event Report (LER) 50-315/98006-00: Interim LER- Procedure Option for Weighing of Ice Baskets in Modes 3 and 4 Determined to be a Potentially Unanalyzed Condition, issued March 3, 1998.

This issue was reported to the NRC on February 25, 1998, pursuant to requirements of 10 CFR 50.72(b)(2)(i) and is discussed in Section M1.1.b.2.2. The failure of the licensee to provide adequate instructions for entry into an unanalyzed condition (unpinning 60 ice baskets) is considered an apparent violation of 10 CFR 50 Appendix B, Criterion V (EEI 50-315/98005-05(DRS); EEI 50-316/98005-05(DRS)). Corrective actions will be addressed by the licensee in resolving this violation, therefore, this LER is closed.

E8.4 (Closed) Licensee Event Report (LER) 50-315/98007-00: Interim LER- Ice Condenser Weights Used to Determine Technical Specification Compliance Not Representative

This issue was reported to the NRC on February 11, 1998, pursuant to requirements of 10 CFR 50.72(b)(2)(i) and is discussed in Section M1.1.b.2.4. The failure of the licensee to select a representative sample of ice baskets to weigh is a violation of TS 4.6.5.1.b.2 (EEI 50-315/98005-07(DRS); EEI 50-316/98005-07(DRS)). Corrective actions will be addressed by the licensee in resolving this violation, therefore, this LER is closed.

E8.5 (Closed) Licensee Event Report (LER) 50-315/98008-00 Failure of Ice Baskets to Withstand Simulated Accident Loadings During Testing Results in Unanalyzed Condition

This issue was reported to the NRC on February 12, 1998, pursuant to requirements of 10 CFR 50.72(b)(2)(i) and is discussed in Section M2.1.b.3. The failure of the licensee to identify/evaluate buckled webbing in lower section of ice baskets is a violation of TS 4.6.5.1.b.2 (EEI 50-315/98005-13(DRS); EEI 50-316/98005-13(DRS)). Corrective actions will be addressed by the licensee in resolving this violation, therefore, this LER is closed.

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on February 27, 1998, and in a final phone exit held March 19, 1998. The licensee acknowledged the findings presented and did not identify any of the potential report input as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

American Electric Power
A. Blind, Vice President Nuclear Engineering
J. Boesch, Maintenance Superintendent
D. Cooper, Plant Manager
S. Farlow, Supervisor I&C Engineering
M. Finissi, Supervisor, Electrical Systems
E. E. Fitzpatrick, Executive Vice President Nuclear Generation Group
D. Hafer, Manager, Plant Engineering
M. Kelly, Nuclear Licensing
B. Kovarik, Safety-related Mechanical Systems
F. Pisarsky, Supervisor, Mechanical Component Engineering
J. Sampson, Site Vice President
P. Schoepf, Supervisor, Safety-related Mechanical Systems
D. Sudhoff, Safety-related Mechanical Systems
A. Tetslaff, Safety-related Mechanical Systems
S. Wolf, Performance Assurance

Duke Power Company
B. Lamb
D. Myer
R. Proctor

American Nuclear Resources, Inc.
L. Demski
M. Poluhanyiz

Westinghouse
J. Matusz
S. McKenzie
C. Scrabis

South Bend Tribune
J. Swidwa

Harold Palladium
S. Aiken

Nuclear Monitor
K. Kamps

WNDU-TV 16
N. Lee

INSPECTION PROCEDURES USED

IP 37700	Design Changes and Modifications
IP 61700	Surveillance Procedures and Records
IP 62700	Maintenance Program Implementation
IP 92700	Onsite Review of LERs
IP 92720	Corrective Action

ITEMS OPENED, CLOSED, AND DISCUSSED

ITEMS OPENED

50-315/98005-01(DRS) 50-316/98005-01(DRS)	EEI	Inadequate instructions for inspection of flow passages
50-315/98005-02(DRS) 50-316/98005-02(DRS)	EEI	Inadequate instructions for selecting flow passages
50-315/98005-03(DRS) 50-316/98005-03(DRS)	EEI	Insufficient margin to analysis limit for evaluating a degraded ice condenser
50-315/98005-04(DRS) 50-316/98005-04(DRS)	EEI	Insufficient margin to analysis limit for maximum gross ice basket weight
50-315/98005-05(DRS) 50-316/98005-05(DRS)	EEI	Inadequate instructions for entry into an unanalyzed condition (unpinning 60 ice baskets)
50-316/98005-06a(DRS)	EEI	Failure to follow the procedure change process for a completed surveillance test
50-315/98005-06b(DRS)	EEI	Failure to follow the procedure change process for a completed surveillance test
50-315/98005-07(DRS) 50-316/98005-07(DRS)	EEI	Failure to select a representative sample of ice baskets to weigh per TS 4.6.5.1.b2
50-315/98005-08(DRS) 50-316/98005-08(DRS)	EEI	Failure to assess and control the quality of work by ice condenser contractors
50-315/98005-09(DRS) 50-316/98005-09(DRS)	EEI	Failure to inspect accessible areas of the lower ice basket per TS 4.6.5.1.d
50-315/98005-10(DRS) 50-316/98005-10(DRS)	EEI	Insufficient margin to TS 4.6.5.3.1.b limit for lower ice inlet door opening torque
50-315/98005-11(DRS) 50-316/98005-11(DRS)	EEI	Insufficient margin to TS 4.6.5.3.2.b limit for intermediate deck door opening force
50-315/98005-12(DRS) 50-316/98005-12(DRS)	EEI	Failure to identify/evaluate missing ice segments in lower section of ice baskets

ITEMS OPENED

50-315/98005-13(DRS) 50-316/98005-13(DRS)	EEI	Failure to identify/evaluate buckled webbing in lower section of ice baskets
50-315/98005-14(DRS) 50-316/98005-14(DRS)	EEI	Failure to identify/evaluate fibrous material in the ice condenser
50-315/98005-15(DRS) 50-316/98005-15(DRS)	EEI	Failure to promptly identify/evaluate missing ice basket sheet metal screws
50-315/98005-16(DRS) 50-316/98005-16(DRS)	EEI	Failure to prevent recurrence of loose U-bolt nuts
50-315/98005-17(DRS)	EEI	Failure to prevent recurrence of separated ice baskets
50-315/98005-18(DRS) 50-316/98005-18(DRS)	EEI	Failure to take prompt effective corrective action ice baskets with failed fillet welds
50-315/98005-19(DRS) 50-316/98005-19(DRS)	URI	Applicability of 10 CFR 50.72 and 10 CFR 21 reporting requirements to the ice baskets with failed fillet welds
50-315/98005-20(DRS) 50-316/98005-20(DRS)	EEI	WCAP-11902 analysis not incorporated into the FSAR per 50.71e
50-315/98005-21(DRS) 50-316/98005-21(DRS)	EEI	As-built ice basket bottom assembly not incorporated into the FSAR per 50.71e
50-315/98005-22(DRS) 50-316/98005-22(DRS)	EEI	As-used ice form not incorporated into the FSAR description per 50.71e
50-316/98005-23(DRS)	EEI	Ice basket modified by 02-MM-032 not incorporated into the FSAR description per 50.71e
50-315/98005-24(DRS)	EEI	Ice baskets modified by 01-MM-048 not incorporated into the FSAR description per 50.71e
50-315/98005-25(DRS) 50-316/98005-25(DRS)	EEI	Westinghouse ice basket seismic load study, dated February 28, 1990 not incorporated into the FSAR per 50.71e
50-315/98005-26(DRS) 50-316/98005-26(DRS)	EEI	Revised replacement ice basket design not incorporated into the FSAR per 10 CFR 50.71e
50-315/98005-27(DRS)	EEI	Unauthorized modification (bolt vice pin) installed in three Unit 1 ice baskets
50-316/98005-28(DRS)	EEI	Unauthorized modification (sheath of sheet metal) installed on a Unit 2 ice basket.
50-316/98005-29(DRS)	EEI	Unauthorized modification (rivets vice screws) installed on a Unit 2 ice basket.

ITEMS OPENED

50-315/98005-30(DRS) 50-316/98005-30(DRS)	EEI	Failure to follow design controls for ice basket cruciform modifications
50-315/98005-31(DRS) 50-316/98005-31(DRS)	URI	As-found operability of ice condenser in question for past plant operation

ITEMS CLOSED

50-315/98004-00	LER	Restricted ice condenser flow passages found to constitute an unanalyzed condition
50-315/98005-00	LER	Lack of an adequate number of screws in the ice basket coupling rings an unanalyzed condition
50-315/98006-00	LER	Procedure option for weighing of ice baskets in Modes 3 and 4 determined to be a potentially unanalyzed condition
50-315/98007-00	LER	Ice condenser weights used to determine TS compliance not representative
50-315/98008-00	LER	Failure of ice baskets to withstand simulated accident loadings during testing results in an unanalyzed condition

ITEMS DISCUSSED

None

LIST OF ACRONYMS

CFR	Code of Federal Regulations
CR	Condition Report
DBA	Design Basis Loss of Coolant Accident
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EEI	Escalated Enforcement Item
FSAR	Final Safety Analysis Report
LER	Licensee Event Report
NRC	Nuclear Regulatory Commission
OL	Operating License
PDR	Public Document Room
PR	Problem Report
STP	Surveillance Test Procedure
TS	Technical Specification
FSAR	Updated Final Safety Analysis Report
URI	Unresolved Item

PARTIAL LIST OF DOCUMENTS REVIEWED

Procedures

EP-10 "Ice Basket Installation Procedure," Revision 2.
12 CHP 5021.MCD.004 "Removal and Replacement of Ice Condenser Baskets," Revision 2.
PMI-2010 "Instructions, Procedures, and Associated Indexes Policy," Revision 24.
12 EHP 4030 STP.250 "Inspection of Ice Condenser Flow Passages," Revision 1.
12 EHP 4030 STP.211 "Ice Condenser Surveillance," Revision 2.
12 EHP 4030 STP.212 "Ice Condenser Basket Inspection," Revision 0.
12 EHP 4030 STP.207 "Ice Condenser Lower Inlet Doors," Revision 0.
12 EHP 4030 STP.245 "Inspection of Ice Condenser Intermediate Deck Doors," Revision 0.
12 EHP 4030 STP.246 "Inspection of Ice Condenser Floor Drain Valves," Revision 0.
12 THP 6020 CHM.106 "Ice Condenser," Revision 0.

Problem or Condition Reports
PR-87-0163- Bay 11 intermediate deck door inoperable due to ice.
PR-87-0176- More than 3/8 inch of ice was found on ice condenser structure in bay 1 and bay 11 rows 8 and 9.
PR-87-0465- In Unit 2 upper containment ice condenser, two center intermediate deck doors were frozen shut by accumulated ice.
PR-87-0466- The intermediate deck doors between air handler units 42A, 43A, 42B, and 43B were found frozen shut by ice buildup.
PR-87-0467- Start of ice build-up on Unit 1 ice condenser doors.
PR-87-0804- More than 3/8 inch of ice/frost was found in the ice bed in rows 1 and 9 bays 3,4,8,11 and 17 during flow passage inspection.
PR-88-0146- During testing of Unit 1 ice condenser intermediate deck doors, 7 of 192 doors failed to meet the opening acceptance criteria.
PR-88-0215- More than 3/8 inch of ice/frost was found in bay 4 between rows 1 and 2 baskets.
PR-88-0427- The chemical sections current practice is to analyze an individual sample on a weekly basis, combining of the samples isn't performed as required by technical specifications.
PR-88-0624- 12 THP 4030 STP.207 did not have proper documentation for declaring the ice condenser inoperable during the testing of the lower inlet doors.
PR-88-0902- Chemical analysis on the ice condenser indicated that the boron concentration was below the TS limits.
PR-88-0914- Several ice condenser baskets have webbing damage.
PR-89-0458- Damage to ice condenser baskets caused by ice basket weighing.
PR-89-0908- An ice basket in bay 21 has PH and boron concentration below TS.
PR-89-1239- Inadequate procedure guidance in 12 THP 4030 STP.211 ice condenser surveillance. The maximum basket weight was in error.
PR-89-1368- 6/13/86 memorandum incorrectly stated the maximum ice basket weight limit.
PR-90-0313- Loose chunk of ice found on one flow passage.
PR-90-0817- Ice condenser lower inlet doors blew open.
PR-90-0979- Ice condenser divider barrier seal had numerous cracks.
PR-90-1016- Discrepancy with plant drawings and FSAR concerning installation of ice condenser divider barrier seals.
PR-90-1326- Five Unit 1 intermediate deck doors stuck shut.
PR-90-1639- Broken U-bolt and missing nuts in Unit 1 and 2 ice condensers.
PR-90-2064- Ice condenser bed inoperable due to maximum bed temperature above 27 degrees.
PR-91-0171- Lower 95 percent confidence limit of boron concentration less than TS.

PR-91-0257- Unit 2 ice condenser bed inoperable due to bed temperature above 27 degrees.
PR-91-0330- Flow path bypassing the ice condenser bed would exist during accident.
PR-91-0745- Unit 2 ice condenser intermediate deck doors frozen shut.
PR-91-1206- Areas not inspected for flow blockage during TS surveillance.
PR-92-0360- Two ice baskets found in Unit 2 missing U-bolt nuts.
PR-92-1181- Unit 1 ice basket bottom cross bar displaced into basket bottom on four baskets.
PR-92-1386- Ice condenser basket U-bolt nuts missing or loose.
CR-93-0488- Ice condenser intermediate deck door 4A frozen shut.
CR-93-0524- Ice condenser intermediate deck door frozen shut.
CR-93-1242- Five intermediate deck doors frozen shut.
CR-94-0075- Intermediate deck door frozen shut.
CR-94-0398- Unit 1 debris in ice baskets and basket ligament damage.
CR-94-0427- Five ice baskets exceeded maximum allowed weight.
CR-94-0744- Ice condenser intermediate deck door 8B failed surveillance test.
CR-94-1825- Debris found in ice condenser floor drains.
CR-94-1894- Calibration documentation not available for ice basket weighing.
CR-94-1902- Three ice baskets exceeded maximum allowed weight.
CR-95-1482- Debris found in ice condenser floor drain.
CR-95-1666- Ice basket retainer beam unsecured.
CR-96-0253- Ice condenser intermediate deck door 9A failed surveillance test.
CR-96-0355- Debris fell into ice basket.
CR-96-0708- Extra displaced cruciforms found in bottom of ice baskets.
CR-96-0875- Two intermediate deck doors frozen over.
CR-96-1611- Ice buildup behind plexiglass.
CR-96-2114- Loose tape on ice condenser top deck doors.
CR-97-0370- Debris found in ice condenser.
CR-97-0554- Three feet of ice basket separated during weighing.
CR-97-2010- Unit 2 ice condenser top deck doors inoperable due to blockage by maintenance equipment.
CR-97-2569- Ice condenser stage working fluid not in accordance with FSAR.
CR-97-2655- Duct tape inside ice condenser.
CR-97-2730- Discrepancy between FSAR and TS value for boron concentration.
CR-97-2806- Gray duct tape in the Unit 2 ice condenser.
CR-97-3244- Damaged Unit 2 ice basket had missing screws in bottom rim.
CR-97-3423- Intermediate deck doors 9A and 20B failed to meet acceptance criterion.
CR-98-0076- Intermediate deck door 19G failed acceptance criterion.
CR-98-0077- Debris found in upper ice condenser.
CR-98-0126- Damaged lower inlet door shock absorbers.
CR-98-0268- Gray duct tape found in Unit 2 lower ice condenser.
CR-98-0306- Four ice basket screw heads found in ice melt system filter.
CR-98-0357- Loose tape on ice condenser top deck doors.

Modifications
02-MM-032 - Repair damaged Unit 2 ice basket 2-3-8.
01-MM-048 - Repair of eight damaged Unit 1 ice baskets.
12-PM-299 - Modify piping on boron solution pump.
RFC-DC-12-762 - Add valve and drain line for air handling units.
RFC-DC-12-943 - Lower ice condenser door seal test.
RFC-DC-01-1272 - Install foam strip to lower ice condenser inlet doors.
RFC-DC-12-1478 - Replace ice condenser door seals.

RFC-DC-12-1576 - Modify ice condenser lower access door.
RFC-DC-12-1670 - Replace ice condenser glycol valves.
RFC-DC-12-1702 - Replace ice condenser lower door frame plate.
RFC-DC-01-1762 - Replace lower ice condenser door adjustment spring.
RFC-DC-12-4049 - Replace fabric on ice condenser deck doors.

Analysis and Evaluations
WCAP - 8304 “Stress and Structural Analysis and Testing of Ice Baskets,” dated May 1974.
WCAP - 8887 “Ice Basket Stress Analysis - D.C. Cook,” dated March 1977.
WCAP-11902 “Reduced Temperature and Pressure Operation for Donald C. Cook Nuclear Plant Unit 1 Licensing Report,” dated October 1988.
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